

V.—On some Darwinistic Heresies.

By Prof. CARL VOGT*.

M. VOGT would not like it to be thought that he does not fully accept the theories of descent, of transformism, and of natural selection—in fact, all the fundamental points upon which Darwinism is based; he only desires to combat certain exaggerations, ill-founded applications, and hazardous conclusions which have been derived from it, and of which it has been attempted to make irrefutable dogmas. To commence with the final thesis to the demonstration of which the speaker desired to apply himself, he says:—"Our present zoological classification cannot be, and is not, what is everywhere said, the expression of actual relationship existing between the different members of a class, order, family, or even genus—a relationship the demonstration of which would be based upon phylogenetic and ontogenetic development,—but, at any rate in many cases, the result of a combination of similar characters which we find in creatures originating from different stocks."

Let us establish, in the first place, some elementary principles.

We generalize far too much when we raise to the rank of a general law conclusions drawn from observations made upon special cases.

Consciously or unconsciously we start from the idea that Nature sets before her a purpose to be attained in accordance with a plan formed in advance, as we do in the case of our own actions, and that she arrives at this end by following the most direct course.

Now it is precisely the contrary that is true. Every natural phenomenon is complex, and can be only the result of a multitude of varied forces, often even opposed to each other. In most cases, therefore, Nature arrives at a certain result or phenomenon only by the most indirect ways. If this were not the case we should no longer have to make experiments; for the art of experimentation consists in the elimination of sources of error, that is to say of opposing influences, which prevent our arriving at a simple result produced by an isolated and circumscribed cause.

To take an example:—Among the Mammalia there is not apparently a more uniform group than the horses or Solipedes. It is only upon differences of the coat, having no influence

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upon the other characters, that the African horses, the zebras, have been distinguished, under the name of *Hippotigris*, from the other horses. Now-a-days we have indigenous Solipedes only in the Old World: those of America have been introduced from Europe at a comparatively very recent historical date; but in the Quaternary epoch herds of indigenous horses traversed the plains of America as they traversed those of the Old World.

We now know the phylogeny of the American Solipedes better than that of the Solipedes of the Old World; we know how the feet and the teeth have been gradually transformed from Eocene to Quaternary times, when the genus *Equus* existed on both sides of the Atlantic Ocean.

Now this genus, which is so uniform, originates from two very different stocks; *it is of diphyletic origin.*

By arranging parallel to one another the lines of descent formed by the genera indicated by palæontologists in America and Europe, and placing the genera opposite each other in the order of the strata, we find, in fact, that we cannot identify any of the genera living on this side of the water during the Eocene, Oligocene, and Miocene epochs with the genera living in America at the same epochs. The *Lophiotheria*, *Palæotheria*, *Anchitheria*, and *Hippariones* of the Old World are different from the *Eohippi*, *Orohippi*, *Epihippi*, and *Anchippi* which mark the same epochs in the New World; and it is a remarkable thing, to which we shall revert, that the differences are the greater as we ascend towards the supposed stocks in the older Tertiary strata. It is only in the Pliocene and Quaternary deposits that we find on both sides of the ocean the identical genera *Hippotherium*, *Protohippus*, and finally *Equus*, the definitive term.

Let us bring these facts together a little in order to draw the conclusions which flow from them. The ancestors of the horses of one side of the ocean were unable to generate descendants on the other shore; there was therefore an insurmountable obstacle, the sea; the two continents must have been separated at least from the Eocene epoch. This conclusion is confirmed by the study of the other series of descent of terrestrial Mammalia with which we are more or less acquainted—the pigs, the ruminants, the camels, and the rhinoceroses of the Old World originate from stocks and pass through genetic stages different from those of the corresponding series of the new continent.

Geological geography, that is to say the delimitation of the ancient continents and seas at different geological epochs as taught to us by geology, must therefore occupy an important

place in phylogenetic speculations, and *any phylogenetic tree which does not take it into account is by that fact alone erroneous or null.*

The above-mentioned facts lead us, in the second place, to conclude that there is *convergence of characters*. As early as 1874, at the meeting at the French Association at Lille, Prof. Vogt brought forward a thesis suggested by the investigation of various parasites (*Entoconcha*, *Sacculina*, *Redia*), and formulated in the following terms:—"Prolonged adaptation to a restricted but predominant cause gradually effaces the divergent characters of types and finally effects, if not their union, at least their approximation to such a degree that the distinctive characters even of the great divisions of the animal kingdom become entirely unrecognizable."

There is reason to widen this proposition. Do we not see this convergence take place in a number of series of animals living in perfect freedom? The more we study animals, even those the phylogeny of which we cannot know, the more we come to facts which lead to conclusions establishing a multiple origin for the groups which are united in our classification. Has not Prof. Hæckel, the monophyletist *par excellence*, been led by his investigations upon the Medusæ to ascribe to them a diphyletic origin?

We see this convergence manifested not only in entire groups, but also in organs. Starting from the limbs of the Chelonians and seals we see set up series of modifications leading to the paddles of the Halisaurians, Cetacea, and Sirenia. Have not these last two orders, differing completely in their dentition and other anatomical characters, indicating very different stocks, been brought together solely because their limbs are constructed in the same fashion?

If, then, convergence is established in many instances, it is our business to examine how it is brought about. So far as we know from palæontological and embryonic investigations, all metamorphoses take place in three different ways:—

1. By the reduction and final loss of primordial characters.
2. By the excessive and unilateral development (*einseitige Entwicklung*) of other characters which often originally existed only roughly sketched out.
3. By changes of function (*Functionswechsel*), which are so frequent, and to which M. Dohrn long since called the attention of naturalists, without finding much response. Change of functions also implies the separation of parts originally united, and the fusion of other parts originally separated.

Prof. Vogt cannot enter into the details which prove these assertions; but, if they are true, it necessarily follows from

them that there is not and cannot be harmonious development in any organism, it being of course understood that a harmonious creature must have all the organs and systems of organs brought to the same level of perfection. There can only be relative harmonies, in this sense, that one or several organs become preponderantly developed, and that the others adapt themselves in such a manner as not to impede but to sustain the functions of these preponderant organs.

Man himself is a proof of what we advance. In him everything is subordinated to the development of the brain. From almost all other points of view he is a retrograde organism, of which the organs, taken separately, are often very inferior to those of other animals. The limbs have retained the ancient pentadactyle type. The eye itself, the superiority of which has been so much vaunted, is in certain respects very defective.

But we arrive at yet other conclusions. If the ulterior development takes place by one of the three courses above indicated, or by their combination, it follows that the possibility of tracing one or the other of these courses must originally exist—in other words, the organs or the rudiments of the organs subject to development and transformation must exist in the anterior conditions either in the embryos or in the ancestors.

From what precedes some consequences result fatal to several dogmas almost universally accepted. There has been established a so-called biogenetic law, according to which the ontogeny and the phylogeny must correspond exactly. The embryos must pass compendiously through the same phases which the stock has passed through during the geological epochs.

From what we have said of relative harmonies it follows that this law is absolutely false in its foundation, and a careful investigation of embryogeny in fact shows that the embryos have relative harmonies of their own quite different from those of the adults. The embryo of a mammal has a chorda dorsalis and branchial clefts analogous to those of a fish or of one of the lower Amphibia. Can there have been an ancestor organized in the same fashion? Never! for such a creature could not have lived, having neither intestine, nor locomotive organs, nor brain, nor organs of sense fitted to perform their functions, which, however, are necessary for free and independent existence.

To explain these contradictions the word *cænogeny*, falsified embrogeny, has been invented. Poor logic, how it is tortured! Nature falsifying herself!

Let us go on. If the ways indicated as those by which the transformations are effected be true, it follows that we can by no means deduce complicated organisms from simple ones which have not even the rudiments of the organs with which the former are furnished. Neither in palæontology nor in embryogeny have we facts which can demonstrate the acquisition of entirely new organs, while ; on the contrary, there are facts in abundance which prove that the ulterior development is effected, as we have stated, by losses (limbs, dentition), or by excessive development of existing rudiments, or by change of function.

If we apply these facts to our phylogenetic speculations we must recognize that the latter must be completely reversed, that the less complicated animals owe their existence to a more or less complete retrogradation, and that they must constitute the final terms and not the foundations of phylogenetic series. In one word, all our genealogical trees at present accepted must be revised from base to apex so far as they do not correspond with the principles enunciated.

It is to be remarked that these views square very well with palæontological facts. We have tortured our minds to explain the presence in the most ancient formations of highly organized types and of what have been in part called collective types, presenting characters oscillating between those of classes and orders now well marked. Cephalopods, Trilobites, Ganoids, and Dipnoids swarm in the ancient formations, and yet these animals belong to the highest types of their respective divisions. They have constituted the stocks of the types which have succeeded them, and their descendants have been formed by the unilateral development of certain organs or rudiments, combined with the retrogradation or the loss of other organs which the stock originally possessed.

Let us return, in conclusion to our starting-point. The phylogenetic development of the different types has been presented to us in the form of trees which branch as they ascend. Accepting this image, we may say that with regard to these trees our classification plays the part of an espalier to the interspaces of which our divisions into subkingdoms, classes, orders, &c. correspond. The branches of the trees to the right and left which arrive in a compartment thus bounded are definitely classed there, although starting from different stocks.